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ON THE MANUFACTURE OF DEODORIZED OPIUM AND TINCTURE.

By Albert E. Ebert, of Chicago.

It is now about thirty-five years since the writer first recorded in the American Journal of Pharmacy his observations on the process of manufacturing deodorized opium and its tincture. It may not be out of place briefly to review some of the facts pertaining to the history of this subject, as well as to recall the suggestions that have been made for improving the official process and make known the medical properties of the preparations.

During the 20's a liquid preparation of opium made its appearance in England under the name of "Liquor Opii Sedativus," manufactured by R. Battley, of Front Street, London. The claim set forth by the originator was that the preparation represented all the beneficial and wholesome and none of the noxious properties of the drug. Possibly this claim and suitable representations of its superiority over the existing official liquid preparations of opium soon made it a popular remedy with the medical profession of England and this country at that period. Although the method of making the preparation was kept secret, yet it was known that the odorous, resinous and some of the other principles of opium had been abstracted from it.

Dr. Thomson, an eminent authority and writer on therapeutics of that period, states that the opium was exhausted with dilute acetic acid, the liquid filtered and evaporated to a dry extract, which was again dissolved in water, and wine or alcohol added in sufficient

quantity to preserve the preparation, which was then made up to the strength of laudanum.

Another writer of that period gives the following formula: Make an aqueous extract of opium from the crude drug, and take of this

Extract of opium	750 grains.
Boiling water	16 ounces.
Alcohol	4 ounces.

Dissolve the extract in the boiling water; allow to cool; add the alcohol; let stand for twenty-four hours; filter through paper and add enough water to measure 20 ounces.

M. Robiquet, of Paris, he who named *narcotine*, proposed a new mode of preparing an extract of opium in the *Journal de Physiologie Experimentale* for January, 1821, as follows:

Make a solution of the crude opium in cold water in the same way as if the aqueous extract were to be prepared; filter and evaporate the solution to the consistency of a thick syrup; shake this repeatedly with ether; decant the ether and evaporate the solution of opium to the consistency of an extract.

In the year 1828, Dr. Robert Hare, Professor of Chemistry in the University of Pennsylvania, suggested the use of ether in the process of preparing laudanum, and by its use removing the objectionable principles contained in this official preparation.

Early in the 30's there appeared on the American market a preparation entitled "McMunn's Elixir of Opium." This, like Battley's, was a secret and a proprietary remedy, and by being extensively advertised, soon became a well-known nostrum, much used by the medical profession, and its popularity has continued to the present time. Although it has no merit of originality—for it was subsequently ascertained that the process for its manufacture was that suggested and published by Professor Hare—yet it has flourished, nevertheless, and prospered, while the original discoverer received no pecuniary reward and little credit—another illustration of how quackery succeeds at the expense of honorable scientific work. Augustine Duhamel, in the AMERICAN JOURNAL OF PHARMACY, 1846, commenting on McMunn's Elixir of Opium, stated that an equally good and efficient liquid preparation of opium could be obtained by exhausting the opium with cold water. He laid special stress upon the fact that the noxious principle, *narcotine*, being very insoluble in cold water, was, with the resin, caoutchouc and ligneous matter, not

taken up or dissolved by the solvent. Dr. Carson, then the editor of this publication, in a footnote, calls attention to the fact that the prevailing opinions regarding the medical properties of *narcotine* were at variance, some authorities claiming for it poisonous properties; others asserting that it had hardly any toxic properties, if not being entirely inert; while still others claimed for it stimulant tonic characteristics.

We next reach the contribution of Eugene Dupuy, of New York City, in the AMERICAN JOURNAL OF PHARMACY for July, 1851, entitled, "On a Substitute for McMunn's Elixir of Opium." The process advanced consisted in the use of cold water in extracting the opium, and in all essential features was similar to the formula of Duhamel. A footnote to this paper by the editor, Prof. William Procter, Jr., is very comprehensive, and in summing up he says:

"In glancing over the long list of the constituents of opium with the view of singling out those to which the unpleasant effect of laudanum may be attributed, perhaps none are more open to suspicion than the odorous principle, resin, acid extractive, thebaine, and perhaps *codeine* and *narcotine* to some extent, although O'Shaughnessy and others have shown that it is extremely doubtful that the latter (*narcotine*) possesses any disturbing quality of the kind." Further on he says: "Landerer, on page 251 of this number of the JOURNAL, speaks of the nauseating and other unpleasant effects produced by the exhalations from poppy plantations during the collection of opium. May not the odorous principle have something to do with this effect, and may not the removal or loss of this in the so-called *denarcotized laudanum* and in *old opium pills* be at least partially the reason of their diminished tendency to produce nausea and headache?" He continues by saying: "Professor Redwood considers the 'sedative liquor of Battley' to be an aqueous solution of opium evaporated to dryness to rid it of the odorous and acid resin, re-dissolved in water, and a small portion of spirit added to give it permanence."

Next in order we come to Dr. E. R. Squibb's contribution which was published in the AMERICAN JOURNAL OF PHARMACY for March, 1860. It is entitled, "Opium as a Therapeutic Agent." In this paper the doctor calls attention to the inefficiency of morphine and its salts fully to represent the medical properties of opium, and gives a formula for a liquid preparation of the drug which should

more fully meet the requirement. He entitles the preparation, "Liquor Opii Compositus." The process of manufacture is based on the extraction of opium with water, the infusion concentrated by evaporation, the product precipitated with alcohol, which separates the albumen, gum and extractive matter; the clear alcoholic liquid is now evaporated to a syrupy consistency, shaken with ether, the ether separated, and to the purified residue alcohol, compound spirit of ether and water are added sufficient to bring to the strength of tincture of opium. Later on the Hoffman's anodyne was replaced by acetic ether.

About the year 1863 the fifth decennial revision of the United States Pharmacopœia was issued, and now for the first time there was furnished an authoritative formula and process to supersede the unofficial and official preparations of opium, which had been considered objectionable on account, either of being proprietary, or that of containing noxious properties, thereby excluding their use in some conditions of disease or the idiosyncrasy of the individual. The adopted formula was undoubtedly constructed and furnished by Professor Procter, and the new galenical was hailed with considerable satisfaction by professional workers.

The writer at this time was employed by Professor Parrish as his assistant in his School of Practical Pharmacy, Eighth and Arch Streets, Philadelphia, and during the course of instruction in the years of 1863 and 1864 each group of students prepared one pint of this deodorized tincture of opium. The numerous operations which took place there by different persons brought out early what seemed objectionable in the process, the most serious difficulty being the separation of the ether from the concentrated infusion after shaking together; the second objection was the expense of the ether treatment. We had soon collected several gallons of ethereal solution, which we tried to purify by distillation, but did not succeed in doing so owing to the danger of fire. The accumulation, which itself was a fire risk, was, after a number of efforts to utilize it, thrown away.

On returning to Chicago the writer became associated with the house of E. H. Sargent, manufacturing chemist, and here again the problem presented itself to him—how to recover the ether without distillation? He finally discovered that the substances which had been taken up by the ether from the aqueous solution of opium

would, by the addition of a caustic alkali, be again thrown out of solution; and in the paper he contributed on the preparation of deodorized tincture of opium, and published in the AMERICAN JOURNAL OF PHARMACY for May, 1867, he gave the following directions:

"Take of common caustic potash one troy ounce; place it in one pint of the ethereal solution, having previously added two fluid ounces of water, and agitate; let stand, and when separated decant the ether, which wash by shaking with distilled water; allow to separate; decant again the ether and keep the same for future use in the manufacture of the preparation." There was no other loss than a certain percentage of waste of ether in the operation of purification.

On examining the substance that had separated from the ethereal solution by the addition of caustic alkali, the writer found it to consist largely of gummy and resinous substances, which were strongly impregnated with the peculiar odor of opium. On treating this precipitated mass with petroleum benzin, he found that nearly all was taken up by the solvent, excepting some dark coloring matter and a crystalline body which, on further examination, he satisfied himself was largely composed of *narcotine*. This feature led to the thought that, as benzin was an equally good solvent for what was considered the noxious substances and did not dissolve the crystallizable principles of the opium, it was superior to ether even aside from its economical advantages.

On putting the above to a test, the writer satisfied himself that his reasoning was in a practical direction, and, after some experimentation, a formula was devised for preparing deodorized tincture of opium in which formula petroleum benzin was substituted for ether. Also, a formula was given for preparing deodorized opium, petroleum benzin being used as the purifying agent. The paper also contained the suggestion that the writer believed it to be a mistake to remove the *narcotine* from any of the preparations of opium.

In the AMERICAN JOURNAL OF PHARMACY for February, 1883, R. Rother contributed a paper on a new process of preparing deodorized tincture of opium, the process being based on the use of a mixture of petrolatum (vaseline) and spermaceti for removing the odorous and resinous matters from the aqueous solution of opium.

In the August number of the same publication George W. Sloan called attention to the fact that in following the process of Mr.

Rother about half of the morphine contained in the opium was lost to the finished tincture. In the December number of the same volume Mr. Rother makes a reply in which he states that he believes the loss of morphine to be due to a fault in the directions given by him in extracting the opium, and not to the mixture of fats for deodorizing.

Next in order, a paper was contributed to the *Druggists' Circular* for April, 1887, by C. E. Federer, in which a process is recommended for preparing deodorized tincture of opium by exhausting the opium with hot water and reducing the temperature of the aqueous solution to the freezing point. This has the serious objection that, while it separates the resinous, fatty and oily matter and *narcotine*, it also throws out of solution a large per cent. of the morphine.

We come now to a period in our review where the committee on revision of the United States Pharmacopœia takes up the subject for research and delegates Prof. E. L. Patch to investigate the supposed advantages that benzin has over ether in the removal of *narcotine*, etc. The wording of the instructions for the inquiry was unfortunate, as there has never been any claim made by those who had recommended the use of benzin that it would remove the *narcotine*, but on the other hand, the claim was that benzin would not extract the morphine or the *narcotine*, and that ether would take out some of the former and nearly all of the latter in the process of preparing deodorized opium. Professor Patch, following the instruction, made a very careful investigation of the subject as submitted, and reported the result at the Baltimore meeting of the American Pharmaceutical Association, 1898, and published in the proceedings, Vol. XLVI, p. 373, from which we copy:

"Comparison.—Lots of 100 grams of No. 40 opium, assaying 16·1 per cent. morphine, washed respectively with 1,400 c.c. of benzinum and ether gave the following results:

	Benzin.	Ether.
Weight of extracted and dried opium	91·00	80·500
Weight of morphine and dried opium	15·05	14·580
Weight of morphine lost in washing	none	·015
Weight of *narcotine* lost in washing	·18	4·425

"Conclusion.—Benzinum, or petroleum ether, is not adapted for use in washing *narcotine*, etc., from opium in making deodorized

tincture, on account of its uncertain character, its low range of solvent power and its disagreeable odor."

We have now come to the last contribution of our review. It was presented at a pharmaceutical meeting of the Philadelphia College of Pharmacy in November, 1900, and was printed in the December number of the AMERICAN JOURNAL OF PHARMACY for that year. It is entitled, "An Improved Process for the Preparation of Deodorized Tincture of Opium," by Frederick T. Gordon, and is based upon the substitution of paraffin for ether in removing the noxious principles from the preparation.

We will now comment upon the reviewed processes. During the 70's, in making a lot of deodorized tincture of opium, an emulsification took place, which was so persistent that it baffled our efforts to effect a separation of the benzin from the concentrated solution of opium. Mr. R. Rother, who was at the time in the employ of the writer, suggested the addition of melted vaseline to the emulsified solution. This happy thought of Mr. Rother, which speedily produced the separation desired, led to further experimentation with this fat. However, it soon became apparent that whenever vaseline was employed in the process, it was always at a loss of the morphine salt, and its use was therefore discontinued. A more satisfactory method which we found to prevent the emulsion is to concentrate the opium infusion to but one-half of its bulk and shake with the benzin, when it will separate readily.

Some time later, when Mr. Rother had gone into business on his own account, he published the paper advising the mixture of vaseline and spermaceti, a trial of which at the time and experiments since with other fats have convinced the writer that, if any part of the morphine is in the free alkaloidal state, it will be taken up and lost in the process of deodorization when such mediums are employed.

On the publication of Mr. Gordon's article recommending paraffin for this purpose, the writer made trials with three different lots of opium, the solutions of which were assayed each time just previous to treatment with the paraffin and after such treatment, three assays being made in each case. The results of this process were:

	Before.	After.
(1) Opium solution	12·91	9·24
(2) " "	13·87	8·58
(3) " "	13·14	8·40

showing an average loss of 4·65 per cent. of morphine.

We will now consider and analyze Professor Patch's investigations. His objections to the use of benzin are: First, that it does not remove *narcotine;* second, its uncertain character, its low range of solvent power and its disagreeable odor.

In answer to the first objection that the benzin does not remove the *narcotine:* This, in the writer's opinion, is the very reason why benzin should be used, for he believes that *narcotine* should not be extracted, as it is not a noxious, but a most beneficial principle of opium; it is not narcotic, but a pure stimulant tonic, and is the very principle which prevents the depression that always occurs when morphine is administered alone. The writer has at different times administered to himself *narcotine* which he has prepared and knew to be perfectly free from any of the other principles contained in opium. This pure *narcotine* he has taken in doses of from one to three grains, every hour, until a dozen or more doses were taken, and the effect has always been that of a stimulant tonic, free from any narcotism.

To the second objection of Professor Patch, the uncertain character of benzin, its low range of solvent power and its disagreeable odor, we have the following to offer:

The benzin of the United States Pharmacopœia, as to its official title, is unfortunate, for the reason that the only articles that are obtainable in the market under the name of benzin are the napthas of low specific gravity, ranging from 0·798 to 0·723, very impure, having a strong and disagreeable odor, and principally used in the arts for painting. The Pharmacopœia defines benzin as a transparent, colorless, diffusive liquid, of a strong, characteristic odor, slightly resembling that of petroleum, but much less disagreeable, and having a neutral reaction, specific gravity 0·670 to 0·675.

The only products that meet the requirement of the Pharmacopœia are the best of the higher gravities of gasolines, which are known in the market as 87° and 88° Baumé, the specific gravity of which ranges from 0·650 to 0·645. The existing difficulty of obtaining these light products is that they are not on sale in the market in less quantities than barrel packages. This condition of things would be changed if a demand were made, for the wholesale drug trade would then keep these grades for sale, as they do now a gasoline of 67° Baumé (sp. gr. 0·716), known as stove gasoline, which is, however, not of such quality and purity as to fit it for use in the deodorization of opium.

In our long experience with these high-grade gasolines on opium we have never met the objection of a disagreeable odor remaining in the finished product. In making inquiries among manufacturers who employ these petroleum ethers in extracting oils, fats, resins, etc., from drugs, we find that our experience is borne out. We hope that the committee on the revision of the Pharmacopœia will give an official name to these lighter products of petroleum of light specific gravity, by which name they can be secured in the market. The present name, benzin, when called for, does not bring the product which the Pharmacopœia demands.

Referring to Professor Patch's table of comparison, we find that ether extracts about ½ per cent. more morphine than is extracted by benzin; that ether removes, if not all, nearly all the *narcotine*, while benzin takes up hardly any. As Professor Patch has no other solvent to suggest, and has tried others, we must still adhere to our position that benzin is the best medium for deodorization.

The remaining processes and formulas that have been suggested and which have been reviewed in this paper may be classed under two headings. The first class includes those by which the opium is extracted by cold water, the infusion evaporated to the consistency of a dry extract, and this dissolved again in water and alcohol added. When thus prepared such products are but aqueous extracts of opium to which sufficient alcohol has been added to preserve them. They can possess no other medicinal value or merit over the dry extract than that of being liquid, and but serve to add to the already large number of preparations that overburden the stock of the drug store.

The second class are the concentrated aqueous infusions, treated with ether to remove the noxious principles which may have been taken up in a very slight degree by the solvent power of the cold water used in exhausting the opium. These possess nothing of merit over the first class except it be the added expense due to the ether treatment. The change in the process in the last revision of the United States Pharmacopœia is somewhat in the right line, for it directs the use of hot water for exhausting the opium, by which process all of the morphine, codeine and the greater part of the *narcotine* are brought into solution; however, the ether treatment vitiates much of the good arising from the hot-water treatment by removing the *narcotine*. The term, *narcotine*, is a misnomer, as the

principle is entirely destitute of narcotic properties. When taken into the system it performs the functions of a powerful tonic, and is the very principle contained in opium that will prevent the depression which follows the administration of the morphine alone. All medical authorities agree that opium increases the temperature from the start, producing a pleasant, warming effect, while morphine lowers the temperature. Opium increases the pulse and morphine decreases it. Dr. Squibb, in his paper on "Opium as a Therapeutic Agent," before referred to, says:

"Observers have found that there are certain good effects obtained or certain unpleasant consequences avoided, more frequently by the use of the natural combination, while all agree that the whole therapeutic power and influence of opium cannot be obtained by any salt of morphine." Did not Dr. Squibb make the addition of Hoffman's anodyne to his *liquor opii compositus*—aside from its power of preserving the preparation—for the stimulating and antispasmodic qualities that the compound spirit of ether possesses? We believe he did so.

As early as January, 1821, in the *Journal de Physiologie Experimentale*, Mr. Robiquet, commenting on his new process for making an extract of opium, says that the nauseating principles of opium exercise no beneficial effects on the general economy, but that it is an established fact that the good effects are the result of the action of properties peculiar to the two principles recently discovered in opium—*narcotine* and morphine. He further says: "The results of Dr. Magendie's experiments confirm this view, as *narcotine* acts as a stimulant substance, while morphine is the real anodyne which induces calm sleep."

The writer of the present paper goes further, and says that he firmly believes narcotine to be a most valuable remedial agent in the treatment of the habits of opium, alcohol and tobacco using; and while he is not in a position to claim that it is a specific, yet his limited observation in the administration of this remedy has been of the most encouraging character. Results of the most beneficial character have been obtained. The action of *narcotine* seems to do away with the craving and the prostration which usually follow deprivation from the usual dose of opium, etc., used by the habitué. We have seen unusually good effects from the administration to these unfortunates of *narcotine* in grain doses

every hour, continuing until from 30 to 60 doses have been administered.

During the time which has elapsed since the writer first became interested in what was originally considered to be an ideal liquid preparation of opium, he has been ever watchful for any suggestions for the improvement of the official process, for he has had a conviction that the preparation, when made by the official process, does not represent the full medical properties of the drug. In his paper upon this subject thirty-five years ago, the writer suggested as an improvement of the official process, aside from the matter of cheapness, the substitution of benzin for ether, upon the ground that benzin did not, while ether did, remove the *narcotine* from the preparation. He has always believed and has many times said, both verbally and in print, that it is a mistake to remove from the deodorized tincture of opium the principle, *narcotine*. With this in view he has, in preparing the deodorized tincture as well as the simple tincture of opium, used every effort to extract and retain in the liquid preparation the *narcotine* of the drug. The process he has found most satisfactory to accomplish this purpose is the following:

Slice the moist opium, place it in a glass, stone or porcelain dish, and by means of a water bath macerate the opium with four parts of hot water for about twelve hours, or until the mass is thoroughly disintegrated. Pour this upon a colander and with stirring and pressure of the hands drain off the liquid. Return the still warm residue to the dish, pour upon it two parts of hot water, macerate again for several hours, keeping up the heat by means of the water bath. Again transfer to colander, press and drain off the liquid as before, repeating the operation of maceration with two parts of hot water and finish as in the other previous proceedings. Mix the liquid obtained by the different operations together, pass through a cloth strainer and commence to concentrate by evaporation to half the bulk of the water employed for extraction. Now take one part of diluted acetic acid and pour this upon the opium residue, macerate by water bath as in above operations for several hours and then place the acid-treated magma upon a coarse cloth strainer and with pressure drain off the liquid. Evaporate this solution to a dry consistency by the heat of a water bath.

Add this dry extractive matter to the watery liquid which is

being evaporated, and when concentration of it has reached four parts by measure let it cool, and add to it an equal volume of gasoline; let stand for twelve hours; separate the gasoline and pass the opium solution through a paper filter and evaporate to half its bulk. Now make a morphine assay and add sufficient diluted alcohol to make the finished liquid opium have a morphine strength of 24 grains to the fluid ounce. A liquid preparation of opium having this morphine strength is to be found in the price-lists of the manufacturers of fluid extracts under different titles. It is recommended by them for preparing easily paregoric, laudanum, deodorized tincture and other liquid preparations of opium, and is said to have a ready sale.

For years the writer has kept this concentrated liquid opium as a stock preparation. He has found that when made more concentrated than four parts by measure to one part by weight of opium used, there will be a separation of crystalline matter, which, on examination, will be found to be largely *narcotine*. When the opium is exhausted only by hot water the average quantity of *narcotine* extracted is about three per cent.; when acetic acid is employed as above directed the amount of *narcotine* extracted averages from five to eight per cent.

We have found that hydrochloric acid is the better solvent for *narcotine*, but have employed acetic acid, as the excess of acetic acid is driven off in evaporating the infusion to a dry state. We have also employed citric and tartaric acids, but they were not satisfactory, as we were unable to adjust the quantity necessary to be used for the purpose.

The writer does not favor a concentrated liquid opium as an official preparation. It is only an additional expense and a danger risk to the pharmacist. We prefer a granular opium which has been freed from its objectionable noxious principles with gasoline. The process that the writer has used is as follows:

The moist opium, by means of a pair of shears, is cut into slices; these are laid on a cloth, which is put into a sieve and set in a warm place to dry. When dry it should be grated. Machines that answer this purpose may be had in the market at a cost of about a dollar. We have found that if the size of the granular powder is from No. 10 to 20 it is fine enough. Now take a glass funnel double the size of the quantity of opium to be operated upon, cork

up tightly the lower end of the stem, but so that the cork can be removed when desirable, and place in the funnel a plain, folded double filter and put the granular opium on the same; press down slightly and pour upon the opium sufficient gasoline to cover it. To prevent evaporation of the gasoline, cover the top of the funnel; let stand over night; then withdraw cork from bottom of funnel, allowing liquid to run into container. Repeat the operation, pouring on gasoline until the solvent takes up no more color from the opium. Now remove the filter containing the opium from the funnel, and spread the opium out to dry, using gentle heat if desired. The gasoline solution extracts from the opium from 2 to 3 per cent. of matter consisting largely of caoutchouc, wax, resin, oily matter, etc., the extracted mass having the strong, peculiar odor characteristic of natural opium.

Reverting again to the granular opium thus purified: The process employed in making the liquid preparations from this purified opium is the same as that used in making it from the crude drug. By this means preparations will be secured having all the beneficial and none of the noxious properties of the drug. We therefore recommend that the next pharmacopœia insert as a new preparation granular opium treated with gasoline. We further recommend that the pharmacopœia give a high-grade gasoline a name that will not cause it to be confused in the market with benzin; we also recommend that *narcotine* be made official as a medicinal agent.

In closing this paper we would recommend that when morphine is prescribed, *narcotine* be added to offset the depressing effects of the former.

THE SPREAD OF TUBERCULOSIS BY COUGHING.

By L. Napoleon Boston, A.M., M.D.
Bacteriologist to Philadelphia Hospital; Demonstrator in charge Clinical Laboratories of the Medico-Chirurgical College.

In view of the popular opinion now prevalent throughout the civilized world that tuberculosis is a disease dependent, in most part, upon certain tendencies transmitted from parent to offspring, it becomes the duty of every one working along these lines to show that tuberculosis is but rarely inherited, but that it is a disease capable of transmission by infected persons to those previously healthy, by contact or by association. It may in like manner be

transmitted by man to domestic animals; while infected animals in turn infect other animals with which they are brought in contact. Man is probably rarely infected by animals, except through the use of milk and meats.

A series of investigations made upon fifty inmates of the Philadelphia Hospital, all of whom were suffering from tuberculosis of either the lungs or throat, showed that such persons emitted a fine microscopic spray, in the acts of coughing, sneezing, talking, laughing and clearing of their throats; and such spray, when collected for microscopic study, was found to contain tubercle bacilli in 75 per cent. of the cases. Sprays collected during coughing always contained many bacilli.

Method of Collecting Spray.—This was accomplished by means of a mask which was made from German silver wire, one piece of which is molded to fit the face, resting on the nose, cheeks and chin. To obviate any irritation to the patient, this portion was covered by a piece of rubber tubing. Suspended from this wire is a second oblong portion provided with two lateral grooves, which serve to accommodate two microscope slides. When the mask is in position the slides are held directly in front of the mouth and nose, at a point 3 inches distant from the lips. The mask is held in position by an elastic band which passes above the ears and over the occiput.

Patients were allowed to wear the mask with the clean slides in position for from one to one and one-half hours during the day when they are apt to cough least, and were instructed to remove it during a paroxysm of coughing. It was never worn during the morning or evening; the object being not to collect on the slide the spray produced by vigorous coughing, but to determine whether or not consumptives always emitted a fine spray that was in any way dangerous to the health of their associates.

Microscopic Study.—Specimens were fixed and stained by carbol-fuchsin and Gabbett's acid blue solution. Of the specimens collected from fifty patients, those from forty-nine were found to contain bacteria, the diplococcus and the streptococcus being the most constant; yet bacilli and clusters of cocci were not unusual. A single minute droplet often contained organisms of each class.

Of these fifty specimens, thirty-eight were found to contain tubercle bacilli in variable numbers, four to six bacilli being the smallest

number found in any specimen; and many of the specimens under a one-twelfth oil immersion lens showed fields of bacilli too numerous to be counted.

Among other findings were large and small squamous epithelium, and occasionally very small epithelial cells more or less intimately connected with thick mucus and leucocytes. The tubercle bacilli were commonly associated with these elements, but were occasionally found singly or a number of bacilli without any other elements in the field.

Conditions Influencing the Spray.—From patients showing tubercular laryngitis and from those who talked loudly, or who were frequently clearing their throats, the most spray was found. In patients very weak, speaking only in a whisper, scarcely any spray collected on the slide, and this seldom contained any bacilli. Men wearing heavy mustaches ejected no spray on the slide until after the mustache was held from falling over the mouth. Coughing with the mouth open must necessarily favor the production of the spray. The detection of the bacilli in these fine droplets of the spray was greatly facilitated by the use of a low-power lens for the purpose of locating such droplets; after which a one-twelfth oil-immersion lens was used. Droplets not perceptible to the naked eye were often found in this manner, and such particles not infrequently contained tubercle bacilli, and at times in great numbers.

Hygiene.—The above detailed observations prove conclusively that persons suffering from consumption are constantly contaminating the air about them with tubercle bacilli, which are perpetually emitted in connection with this spray. This spray may remain floating in the air of a room for hours, and may alight on the furniture, carpets, etc., but whenever agitated it rises from such articles in the form of dust, again polluting the air of the room. Persons entering the room of a consumptive must, therefore, take into their lungs with each inspiration a variable number of tubercle bacilli, depending entirely upon the degree of contamination of the air in that room. If the person breathes with the mouth open the bacilli may enter the throat and be swallowed. In this manner infection takes place through the alimentary tract. The taking of food is liable to excite coughing in consumptives, and for this reason it is indiscreet for healthy persons to dine at the same table with them, for the spray collects on the food to be eaten by all.

Since tuberculosis is a disease so common amongst cooks and bakers, I am inclined to believe that much of our bread and pastry is polluted in this manner; but fortunately for us, these foods are later heated to a degree sufficient to kill the tubercle bacilli.

In the light of our present knowledge it appears reasonable to presume that most cases of "so-called" inherited tuberculosis develop in persons who contracted the disease by constant exposure to the bacilli in this manner while the diseased parent was living. Such infection is usually combated by the child and held in abeyance until during later life, when, from some cause or other, the general vitality is reduced and this previously inert nucleus of infection is permitted to develop with flaming rapidity.

LIQUID SOAPS FOR SURGICAL AND TOILET PURPOSES.

By M. I. Wilbert,
Apothecary at the German Hospital, Philadelphia.

Fashions change! This truism holds good even with medicines and medicinal preparations. About two years ago we reported through the American Journal of Pharmacy a number of formulas for preparations of soap. Among these was one for a liquid antiseptic soap that had been in use at the German Hospital for several years, as a substitute for antiseptic cake soaps in the operating-room, and was also used in place of the ordinary green or soft-soap in preparing the patient for operation.

But as a thing is good only so long as there is nothing better to take its place, we found that the popularity of our antiseptic soap had been suddenly eclipsed by the supposed advantages of a commercial liquid soap that had been purchased for trial and comparison.

One of the apparent advantages, and probably the greatest, was the fact that a copious lather was readily produced, with very little exertion; this, it was thought, would facilitate the removal of dirt and microorganisms by mechanical means, the theory being that the particles of dirt would be picked up by the foaming bubbles of soap and carried away from their natural lodging-places; enveloped in the resulting mass of lather, they would readily be washed away in the subsequent rinsing in clear water.

The new soap was also distinctly alkaline. This was thought to be an advantage in loosening or liberating the dead epithelial cells, and

thus facilitate, not alone their removal but also the removal of any microorganisms that may have found shelter under or along their edges.

Theoretically this soap was very good, and practically it did all that was claimed for it. The free alkali that was present, while strong, did not appear to be particularly injurious, and the soap could be used repeatedly without any material injury to the skin.

The great objection, from our point of view, was the price; and while it was not to be expected that the manufacturers of such an article would devise a formula and spend large sums of money advertising the finished product without expecting some very material returns in the shape of profit, nevertheless, we felt that we had the right to get together something that would answer our purpose as well, at less cost.

The formula that we finally determined on is a solution of a soda soap in dilute alcohol. Probably the only advantage that soda would have to offer in place of potash is the saving in price—soda being about 50 per cent. stronger as an alkali, and costing, pound for pound, about half as much.

The formula now used is as follows:

Cottonseed oil	300
Alcohol	300
Water	325
Sodium hydrate	45
Potassium carbonate	10
Ether	15
Carbolic acid	25

The necessary technic of the formula is very simple. To the oil contained in a bottle of sufficient size, add 100 c.c. of water and 200 c.c. of alcohol; add the sodium hydrate and shake, or stir occasionally until saponification has taken place, then add the remaining portions of the alcohol, and the potassium carbonate dissolved in the water; lastly, add the carbolic acid and the ether and mix or shake well.

Keep in well-corked vials to prevent evaporation of the alcohol. It is advisable to keep the soap at a temperature not below 10° or 12° C., so as to prevent solidification, although this does no permanent harm, as the soap will liquefy again if placed in a warm place for an hour or more. The soap obtained by this process is a light yellow liquid, with a not unpleasant ethereal odor, and a distinctly

alkaline reaction. A few drops poured in the palm of the hand, after previous wetting, will give, with very slight rubbing, a copious lather that stands up well for a considerable length of time.

Its advantage, in surgical practice particularly, depends on its detergent action. The theory of this detergent action was mentioned above, and we need not repeat it here.

For washing instruments after an operation, the use of liquid soap is more economical and requires less work than the ordinary hard or sand-soap, and has the great additional advantage, over the latter especially, that it does not injure the soft plating on the handles of the instruments, nor would it effect the cutting edges of the knives and scissors as would the gritty particles of sand.

Besides the advantages that such a preparation has for the needs of the surgeon and physician, as a cleansing agent and antiseptic, a modification of the same formula has uses that are entirely foreign to those at the bedside or the operating room.

Using the same formula, but omitting the ether and carbolic acid, and substituting for them a few drops of an essential oil, like oil of rose geranium or oil of bergamot, we will have an excellent substitute for cake toilet soaps that are so extensively used at the present time. This aromatic soap solution has advantages in various directions. To facilitate the production of a copious lather in washing it has no equal; as a substitute for shaving soaps or shaving creams, it should fill a proverbial long-felt want. All that is necessary is to place a few drops of the liquid soap in a shaving mug, wet the brush with water and agitate, or stir it about with the soap; in the course of but a few seconds we will have a copious and permanent lather that answers our purpose very well.

As a detergent for shampooing it is excellent, for the same reasons that it answers as a shaving soap. A small quantity of the soap makes a copious lather that removes and retains dandruff as well as the grease and dirt that usually accumulates on the hair and scalp.

In cases where more than one person uses, or is expected to use the same soap, as in public lavatories, there is always more or less danger of transmitting various loathsome and more or less disagreeable skin diseases from one to the other. This danger could be entirely overcome by using a liquid soap, protected as this would be by a glass vial. In addition to its being protected from contact

contamination, this soap is also protected from any possible contamination by means of dirt or organisms floating about in the air.

Aside from this possible use as a toilet article, this soap can also be used to advantage at the prescription counter. You all know how difficult and sometimes disagreeable it is to wash a graduate or bottle in which we have had a fixed oil or resinous material. With the aid of a few drops of this soap it should become a pleasure, as the copious lather that is readily produced takes up and retains the particles of oil and allows the graduate or bottle to be cleansed with a minimum of labor. Another use is in washing the hands after handling odorous, or highly colored substances; but a practical trial is worth more than pages of advice, so let me suggest to you—try it for yourself.

FLUID EXTRACT OF NUX VOMICA.

By Ferdinand A. Sieker.

The U. S. Pharmacopœia of 1890 directs the extract of nux vomica to be deprived of oil with ether. The fluid extract is directed to be prepared by exhausting the powdered drug with a menstruum consisting of alcohol, water and acetic acid, but no directions are given for depriving this preparation of oil. The fluid extract when thus prepared becomes turbid after standing for some time, owing to the separation of a little oil. Ordinary filtration does not remedy this defect, because all of the oil cannot be separated in this manner.

About one year ago the writer published[1] a method for separating the oil from the powdered extract of nux vomica by means of paraffin. The same method has recently been applied to the fluid extract. An attempt was first made to separate the oil direct from the fluid extract by warming it to the melting point of the paraffin, agitating and allowing it to cool, but the result was not satisfactory. Experiments made with a number of other fluid extracts have shown that oil cannot be directly extracted with paraffin from an alcoholic or hydro-alcoholic solvent.

In the next experiment the aqueous solution of extract which resulted after recovering the alcohol from the percolate of the drug was warmed and treated with paraffin. The details of the process are as follows:

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[1] Pharmaceutical Review, Vol. 19, No. 2, 1901.

One thousand parts of ground drug were practically exhausted by percolation with the U. S. P. menstruum for fluid extract of nux vomica, the alcohol was recovered by distillation and the residue diluted with water to 500 parts. Forty parts of paraffin were added and the mixture heated to 70 or 80° C. and briskly stirred for half an hour. It was then set aside for twenty-four hours in a place where it cooled slowly so that the paraffin had a chance to rise to the top before congealing. The congealed paraffin and what it carried with it was separated and the aqueous liquid was then treated in the same manner with thirty parts of paraffin. The paraffin, etc., that was separated was warmed and stirred with sixty parts of water acidulated with acetic acid and then set aside to cool, when the liquid was separated and added to the more concentrated solution of extract. The mixed solutions were strained through a closely woven but comparatively thin muslin. The aqueous solution was carefully evaporated to about 400 parts and the percentage of extractive determined by drying 10 grammes at 100° C. The amount of extractive was deducted from the total weight of the solution, which gave the amount of water present. For every 1000 grammes of water present in the solution 3000 c.c. of alcohol was added. The percentage of total alkaloids was then determined and the preparation diluted with a mixture consisting of one volume of water and three volumes of alcohol until 100 c.c. represented 1·5 gramme of total alkaloids.

After settling, a perfectly clear fluid extract resulted. Its odor was not as disagreeable as when prepared in the ordinary way. A tincture prepared from it had a pale color in comparison with a tincture prepared from the powdered extract. This tincture which was first clear soon became turbid, but after standing for a few days became perfectly bright except for a little sediment.

Twenty-five cubic-centimeters of the fluid extract was evaporated, the extract dissolved in water acidulated with sulphuric acid, and then shaken with benzine and later with ether. The benzine removed 0·0130 gramme or 0·052 of 1 per cent. of fat. The ether removed 0·0230 gramme or 0·092 of 1 per cent. of resin.

LABORATORY OF LEHN & FINK, NEW YORK.

ADULTERATION OF DRUGS AND FOOD PRODUCTS.[1]

By Albert Robin, M.D.,
Pathologist and Bacteriologist of the Delaware State Board of Health,
Newark, Del.

There is hardly a subject of such vital importance, so far-reaching in its effects on our health and pocket-books, so much in need of careful consideration and yet so little considered, as the one before us. Occasionally we see a startling statement made by some of our newspapers; at times we hear of an adulteration-law enacted by a wise State, but on the whole there prevails a general indifference, which implies only one thing, namely, the desire of the people, and the most intelligent among them, to be, as Wiley forcibly puts it, "cheated, fooled, bamboozled, cajoled, deceived, pettifogged, hypnotized, manicured and chiropodized." How else would you explain the seeming anomaly in the fact that a few unscrupulous men produce and sell to the unsuspecting consumer stuff which we would not give to our dogs for fear of making them either sick or feeble? And this is done in a country with an average of general education superior to any other in the world. What becomes of the knowledge of physiology imbibed at the expense of great effort at our public schools? Were not we taught that sand and terra alba are indigestible, not being acted upon by the juices of the stomach or intestines? that alum, copper, lead and other minerals are not food-stuffs, to say the least? Suppose we give a schoolboy the following problem: If you pay for half a pound of coffee 10 cents, how much do you pay for one pound? Why, 20 cents, of course, answers the smart Johnny. But John pays 20 cents for a pound-package of coffee containing only half a pound of the genuine bean and the rest chicory, grains of corn, wheat, rye, roots and seeds of dandelion, mangel wurzel, turnips, beans, peas—any or all of them—and fully believes that he is getting a *pound* of coffee for 20 cents, and that the manufacturer is in business for his health, while he, John, reaps the benefit of this health-measure. What becomes of the common sense and sound judgment of the usually alert and intelligent John? Suppose he reasons thus: "Do we ever get anything for nothing? or is the manufacturer of the coffee I buy at such a low price a

[1]Address delivered at the last Annual Meeting of the Delaware Pharmaceutical Association, and read by invitation at the Philadelphia College of Pharmacy Pharmaceutical Meeting, February 18, 1902.

philanthropist? How does it come that it is so cheap? Evidently, there is something in my coffee which increases the bulk and thus cheapens the product. Why is the maple syrup I buy so extraordinarily cheap? Evidently, there is not much maple syrup in it." You are right, John, the maple syrup you buy at the bargain counter is composed entirely of cane-sugar and starch flavored with extract of hickory bark. Your jellies have never inhaled the flavor of the natural fruit from which they are claimed to be made; your honey has never been manufactured by the industrious bee; your "pure refined lard" is but a mixture of lard stearine and cottonseed oil; in short, a great deal you eat and drink is altogether different from what it is claimed to be and what you buy it for. As a witty poet, quoted by Wiley, puts it:

"Placid I am, content, serene.
I take my slab of gypsum bread,
And chunks of oleomargarine
Upon its tasteless sides I spread.
The egg I eat was never laid
By any cackling, feathered hen;
But from the Lord knows what, 'tis made
In Newark by unfeathered men.
I wash my simple breakfast down
With fragrant chickory so cheap,
Or with the best black tea in town—
Dried willow leaves—I calmly sleep."

Even a "guarantee" on the label is no assurance of purity of the product, as the following case illustrates:

The "Boston Baking Powder" is put up in cans having on the bottom the following label: "All grocers are authorized to guarantee bread, cake, pastry, and all other products made wherein our powder is used free from alum, lime, ammonia, terra alba, rochelle salts or anything injurious as a result of its use." "As a matter of fact," remarks the analyst of the Massachusetts State Board of Health (31 Annual Report) "this brand of powder contains alum, calcium sulphate (terra alba) and ammonia. The label is somewhat ingenious, for it will be noticed that grocers are not authorized to guarantee the *powder* to be free from these products, but what they do guarantee is that *bread, cake* and *pastry* made from this powder are free therefrom. This statement is partially true in that the alum present in the baking powder ceases to be alum when found in the bread, having been transformed into

aluminium hydrate, and . . . the ammonia is driven off by the process of baking."

Time will not permit me to enter into details about the various sophistications of foods and food products. The following list from Battershall will give you an adequate idea of the *common* adulterations. As to the *uncommon* adulterants, they include such palatable substances as sawdust, horseliver, oak bark, colored earths, factory sweepings, brick-dust, and numerous others which the ingenuity of the manufacturer suggests, and which baffle all efforts at detection, owing to their uncommonness.

The *regular* list, then, includes:

Bakers' chemicals	Starch, Alum.
Bread and flour	Other meals, Alum.
Butter	Water, Coloring matter, Oleomargarine and other fats.
Canned foods	Metallic poisons.
Cheese	Lard, Oleomargarine, Cottonseed oil, Metallic salts.
Cocoa and chocolate	Sugar, Starch, Flour.
Coffee	Chickory, Peas, Rye, Corn, Coloring matter.
Confectionery	Starch-sugar, Starch, Artificial essences, Poisonous pigments, Terra alba, Plaster-of-Paris.
Honey	Glucose syrup, Cane-sugar.
Malt liquors	Artificial glucose, Bitters, Sodium bicarbonate, Salt.
Milk	Water, Removal of fat.

Mustard	Flour, Turmeric, Cayenne pepper.
Olive oil	Cottonseed oil, Other oils.
Pepper	Various ground meals.
Pickles	Salts of copper.
Spices	Pepper dust, Starch, Flour.
Spirits	Water, Fusel-oil, Aromatic ether, Burnt sugar.
Sugar	Starch-sugar.
Tea	Exhausted tea-leaves, Foreign leaves, Indigo, Prussian blue, Gypsum, Soapstone, Sand.
Vinegar	Water, Sulphuric acid.
Wine	Water, Spirits, Coal-tar and vegetable colors, Factitious imitations.

Truly, a list to suit the most capricious taste. It almost seems that after consuming such food one could go on sword-swallowing with impunity.

In a recent report of the Illinois State Food Commission (1899–1900) we find the following table of adulterations detected during the year:

Article of Food.	Number Analyzed.	Number Adulterated.
Baking powder	44	44
Butter	49	36
Catsup	47	45
Cider (apple)	3	1
Cider (orange)	1	1
Coffee	15	0
Condensed milk (bulk)	4	1
Condensed milk (cans)	22	4
Cream of tartar	11	2
Honey	22	9
Jellies, jams, etc.	13	9

Lemon extracts	34	27
Milk	29	5
Olive oil	25	13
Sugar (granulated)	1	1
Vanilla extract	26	20
Vinegar	360	192
Total	712	412

Of 61 samples of milk purchased of milk dealers in the city of Wilmington and examined by the Delaware State Board of Health Laboratory, 39 contained formalin, 12 were skimmed, 3 were watered, 5 were skimmed and watered, and 2 were suspicious.

The superficial observer will probably conclude that adulteration is accidental and irregular; that it depends entirely on the honesty and business integrity of the individual manufacturer. This is far from being the case. Sophistication is an economic factor in the struggle for trade. Cheaper products are demanded by the poor and cheaper products are supplied; but as the only way to cheapen them is to sophisticate, adulteration is practised as a bona fide business measure. As a result, we have fraud reduced to a system; fraud not regulated by conscience or principles; fraud from which the otherwise honest man does not shrink, but, nevertheless, fraud which robs the poor man of the money he earns by the sweat of his brow.

This fact has been clearly brought out by the Senate Committee appointed to investigate the extent and nature of adulteration of foods (Senate Report, Vol. 3, No. 516). "The adulteration of prepared or manufactured foods," says the committee, "is very extensively practised, and in many cases to the great discredit of our manufacturers. It is only fair to say, however, that a large proportion of the American manufacturers who are engaged in adulterating food-products do so in order to meet competition, and it is the expression of those gentlemen to say, 'We would be glad to get out of the business of adulterating. We would like to quit putting this stuff in coffee, and would be willing to brand our syrups for what they are, but our competitors get a trade advantage which we cannot surrender.'"

This position, however, cannot be maintained with regard to drugs. Here, evidently, the price to the consumer does not enter into consideration, the prices being, as they mostly are, altogether

out of proportion to the original cost. Neither does competition, in so far as the retail price of the drugs is concerned, compel the druggist to reduce the cost which may be said to be fairly uniform with a liberal margin for wholesale fluctuations.

Adulterations of drugs, therefore, is nothing less than an abominable fraud which ought to put to shame any self-respecting man practising it. This fraud, like a double-edged sword, cuts in two directions: (1) By it money is obtained under false pretense, alike from rich and poor, an offence which in other walks of life is punished by law; and (2) human life or health is frequently placed at stake for the gain of a few paltry dollars. There is still a third aspect to this evil: It retards the progress of materia medica in the proportion as the physician fails to achieve the desired effect, and, not suspecting the genuineness of the drug he uses, does not believe in its virtues. The reason for the sophistication of drugs is to be sought in the cloak of mystery with which medicine has been wrapped up from time immemorial. The sick know naught of the drugs they are made to take, nor do they care to know. Medicine to them is still a black art, and what they want is charms, being altogether indifferent as to whether these are made of scraps of paper, worthless herbs or roots or plain sugar. The physician, on the other hand, has been in the past so deeply entangled in the web of polypharmacy that one or two worthless or adulterated drugs made little difference among two or three dozen others. His was truly a shotgun prescription: if one shot missed the mark the others might hit it. From these dark ages of polypharmacy the physician emerged into the fruitless age of proprietary medicine, an age so remarkably barren of results and so inimical to scientific progress! In the proprietary medicine we have the same shotgun, only the loading is done by somebody else, the physician pulling the trigger. He even does not know how many shots are in the barrel or what they are made of. What does "eudoria" stand for? For nothing. All we know is that it is a wonderful combination of remedies, possessing extraordinary virtues not to be found in any of the drugs mentioned in the Pharmacopœia or the National Formulary. This remarkable panacea stops diarrhea and moves the bowels, relieves pain, cures headache, dizziness, dropsy, influenza, rheumatism and all other ills human flesh is heir to. "Doctor," proclaims the illustrious inventor of the miraculous panacea, "why bother

your head about the thousand and one drugs of your materia medica? Why be troubled about their composition, properties, physiological effects and incompatibilities when 'eudoria' does it all, and all you need remember is the name? Of course, you will be particular to specify 'The Fraud Pharmacal Company,' for, you see, there are worthless substitutes on the market." And the wise physician goes on using "eudoria." His patients get well with or in spite of it, and by the end of his professional life he finds in his mind a blank with the meaningless word "eudoria" inscribed on it. Under these circumstances we can well understand why sophistication of drugs is so universally practised. Fortunately, the medical profession is gradually recovering from the mental stupor into which it was thrown by the "Fraud Pharmacal Co." and the like. The Pharmacopœia is taken off the dusty shelves and carefully looked over; the materia medica is again looked into inquiringly; the physician no longer "puts a drug of which he knows little into a stomach of which he knows less." The dawn of scientific medicine is upon us and, *pari passu*, the searchlight of rigid inquiry is thrown upon the composition of drugs and their adulterations. What is revealed will be seen from the few facts which time and space allow me to mention—it would require a volume to cite them all.

Before I take up the various sophistications commonly practised I will quote Hassal's definition of adulteration: "It consists in the intentional addition to an article, for the purpose of gain or deception, of any substance or substances the presence of which is not acknowledged in the name under which the article is sold." This definition is somewhat incomplete, for it does not include the substitution of an article of an inferior quality. Thus we find that in the case of vegetable drugs, herbs of inferior quality are sold, although there is no actual addition of substances different in name or appearance from the one asked for. In looking over the reports of the several State Boards of Health which have investigated the subject, we find[1] that cinchona has been found very variable in quality; that a large quantity of poor bark has been frequently on the market; that worthless bark has been often offered for true calissaya and red bark. Wild cherry has been seldom of prime

[1] Supplement 6, National Board of Health Bulletin.

quality, being frequently adulterated with sassafras bark. *Belladonna* is often of bad quality, having become deteriorated. *Hyoscyamus* has been found to contain 8 per cent. of impurities, such as bay leaves, straw, feathers, oak, stone, branches from unknown plants, etc. *Aconite* is often moldy, partially or entirely exhausted and redried. *Sarsaparilla* is adulterated with clay, foreign roots and dirt. The following admixtures were actually found in some samples: Nut galls, mastic stems, bay, belladonna and digitalis leaves, paper, bark, straw, ipecac and may-apple. *Copaiba* has been found to contain 6 to 8 per cent. of fat oil. There is also a factitious copaiba composed of linseed oil, castor oil, turpentine and sufficient copaiba to give odor. *Opium* has been found to contain 20 per cent. of foreign matter, chiefly lead. Clay, wax, cherry gum, extract of licorice and fused colophony have been detected in the gum, while occasionally the entire gum is composed of clay and cow's dung. The powdered drug is frequently adulterated to the extent of 50 per cent., starch being the usual adulterant. *Ginger* is adulterated with lime. *Hydrastis* with beet-root, serpentaria, cypripedium, sanguinaria, may-apple. Powdered *rhubarb* with turmeric. Powdered *capsicum* with red lead, vermilion, venitian red, brick-dust, ground rice, turmeric, mustard husks, cornstarch, wheat and horseradish. *Mustard* with cornstarch, potato starch, turmeric and capsicum. *Asafetida*, with stone, sand, and other foreign substances. *Gum arabic*, with marble-dust, sand, dextrin. *Castor-oil*, withwhale oil, lard oil and croton oil. *Olive oil*, with paraffin oils, cottonseed oil, oil of benne, nut oil. *Sulphur*, with gypsum (50 per cent.), sulphate of calcium. *Tartaric acid*, with sulphate of sodium and alum. *Ammonium carbonate* has been found to be made from ammonia, glue and bicarbonate of soda. *Subnitrate of bismuth* often contains phosphate of calcium; *calcium carbonate*, burnt bones; *iron by hydrogen*, charcoal; *bichloride of mercury*, common salt; *bitartrate of potash*, calcium carbonate, farinaceous matter, calcium sulphate, cornstarch; *potassium iodide*, bromide of potash.

It may be remarked that by purchasing the drugs from reliable firms, the above-mentioned adulterations are not likely to be found. This is no doubt true, but unfortunately, druggists are often tempted by the low prices at which drugs are offered by some unscrupulous wholesalers. That this is frequently the case we gather from the fact that samples purchased from various druggists at random do

show either adulterations or inferior quality. Thus, in a recent report of the New York State Board of Health we find that the following drugs were found adulterated:

Name of Drug.	No of Samples Analyzed.	No. Found Adulterated.
Seneca root	23	5
Virginia snake root	21	1
Sarsaparilla root	23	14
Digitalis leaves	22	10 (deteriorated)
Spanish saffron	20	17
Myrrh	21	6
White wax	17	6
Oil of cocoa	19	6
Quince seeds	13	7
Lupulin	18	7
Arrow root	20	8
Ipecac, powdered	22	10
Jalap "	22	8
Orris "	19	9
Rhubarb "	23	6
Mustard "	24	12

During a single year the Massachusetts State Board of Health detected the following adulterated drugs:

Acidum tannicum: Ten samples examined; five found to contain resin or foreign gums.

Æther: Two samples examined; both contained too much alcohol.

Aqua ammonia fortior: One sample; too weak.

Bismuth subnitrate: Ten samples analyzed; five contained carbonate.

Calx chlorata: All of the samples analyzed found below standard.[1]

Diabetic flour: Thirteen samples analyzed; only three, the product of one manufacturer, were found free from starch.

Extractum glycyrrhiza: Nine samples examined; all found to contain cornstarch.

[1] A number of samples analyzed by the Delaware State Board of Health Laboratory contained only from 5 to 12 per cent. of available chlorin.

Ferri et quininæ citras: Eight samples examined; two contained insufficient quinine.

Glycerin: Twenty-nine samples examined for arsenic; twenty were found to contain from traces to 0·002 in 25 grammes of sample.

Limonis succus: Twelve samples analyzed; all adulterated or impure.

Oil of lemon: Six samples analyzed; five contained oil of turpentine.

Olive oil: Fifty samples examined; thirteen consisted wholly or in part of cottonseed oil.

Potassium bitartras: Of twenty-one samples, two were adulterated with cornstarch, gypsum and acid phosphate of lime.

Sulphur præcipitatum: Of fifteen samples, ten contained calcium sulphate.

Tr. Opii: Of thirty-nine samples, thirty-four were found below the standard.

The last, of course, indicates that the crude opium from which the tincture was made, was not of standard strength.

During the fifteen years, from 1883 to 1897, the Massachusetts State Board of Health examined a large number of samples of drugs with the following results:

Year.	No. of Samples Analyzed.	No. Found Adulterated.	Percentage.
1883	603	246	40·8
1884	682	251	36·8
1885	1,007	436	43·3
1886	888	425	47·8
1887	550	150	27·3
1888	862	228	26·4
1889	600	97	16·2
1890	400	75	18·7
1891	424	72	17·0
1892	487	175	35·9
1893	327	99	30·3
1894	487	103	33·5
1895	544	332	61·0
1896	565	254	50·3
1897	8,366	3,303	35·9

Thus we have an average of adulteration of 34·74 per cent. This is in a State which enjoys a pure food and drug law well conceived and admirably executed. What takes place in the States less fortunate you can well imagine. In our own State of Delaware, Professor Penny, the chemist of the Delaware College Agricultural Experiment Station, while analyzing a patent medicine for the cure of hog cholera, made the startling discovery that powdered antimony, which was supposed to enter into the composition of this "cure" (copied bodily from a formula published by the Bureau of Animal Industry), as well as samples labeled "antimony sulphide," in the possession of the station, contained no antimony at all. He then obtained samples of antimony from various druggists of Wilmington and other parts of the State, as well as New York, Pennsylvania, New England and the Southern States. The result was that out of forty-one samples sold by the general retail drug trade, only seven were found to be unadulterated commercial antimony sulphide; one contained a small quantity of the salt mixed with coal dust, and thirty-three were entirely free from antimony in any form. Those examined more completely were mixtures of carbon, as coal dust, sometimes a little charcoal or graphite, with chalk and sand. Subsequent to this experience the Experiment Station of Nebraska published the account of a similar experience. Pretty hard on the hog (or the owner)! Professor Penny also analyzed, by request of Dr. Black, a number of samples of gluten bread for diabetics, claimed to be free from starch. The latter, however, was found in every sample in the proportion of 50 to 75 per cent.

There is still another form of sophistication, and that is in the sale of worthless remedies proclaimed to possess marked therapeutic virtues. Many of the so-called proprietary remedies belong to this class. Even remedies, the approximate composition of which is stated, and which are purported to be an improvement on the U. S. P. or the National Formulary, frequently possess no medicinal virtues. The various preparations of pepsin may be cited as an example. I had occasion to examine a number of samples of the various elixirs and other combinations of pepsin. Several of these proved practically inert when tested by the egg-albumen test. A gentleman, whose authority in the matter I consider unquestionable, writes me that "A good many years ago an eminent chemist and physician stated that he had found by assay wines of pepsin to be practically inert.

"Unfortunately," continues the writer, "the condition of affairs in the applied chemistry of the digestive ferments is such that obviously incompatible and inert preparations are persistently offered, the peculiar physiological nature and relations of these ferments being either ignored, or not at all well understood. If you take up the diastasic enzyme, for instance, you will find products which are represented to contain diastase and 'ptyalin' in solution with other ferments, to be devoid of starch-converting power. Elixirs of 'pepsin and bismuth' are quite generally manufactured and used, and are even found in 'formularies,' whilst the fact remains that bismuth in solution destroys pepsin, that no permanent solution (elixir or other) can be made which contains pepsin in conjunction with ammonio-citrate of bismuth in any form in which it is commonly used in these prescriptions." In the case of manufactured drugs, such as fluid extracts, pills, tablets, etc., we find that, through no fault of the manufacturer, the drug or combination of drugs deteriorates in time and becomes either deficient in its physiologic activity or entirely worthless. Organic matter, especially alkaloids, are bound to deteriorate on keeping, and even if no visible changes take place, owing to some special form of preservation, certain intrinsic changes undoubtedly do occur. Is there any one here who will affirm that a preserved pear or peach tastes exactly like the fresh fruit? Every one of you has observed the changes, even visible to the naked eye, which take place in your fluid extracts and tinctures. As to pills and tablets, they are often mere mummies of the original drug. They have been driven through boards and passed uninjured the alimentary tract, and I am sure that many of them bear the same relation to the fresh drug as the Indian mummy at the Washington Museum does to the original Indian. "A ready-made pill—to coin a new definition—is a powdered drug embalmed in sugar and so coated as to remain impervious. It may be used in time of war instead of bullets." Many of the official pills have been found deficient in alkaloidal strength. Thus, the New York State Board of Health found that quinine pills, stated to contain 2 grains, only had 1·7, 0·9, 1·3, 1·6, 1·8; 3-grain pills showed 2, 2·5, 1·7, 2·7, 2·5; 5 grains 3·4, 4·4, 4·5 and 2·4.

My paper will not be complete without mentioning still another form of sophistication which is really a simple fraud. I allude to patent medicines. I may state, without fear of contradiction, that

patent medicines are one of the greatest evils this country is afflicted with. They demoralize the people by engendering a constant dread of disease, so-called, pathophobia. They are responsible for the pernicious system of self-medication for imaginary or real ills; they frequently ruin health and jeopardize life; they divide the people at large into two classes: a larger one, composed of fools, and a smaller, made up of sharps who live by their wits at the expense of the fools —in short, the patent-medicine vender is nothing but a parasite of the worst kind, and the welfare of the social organism depends solely on the absence or presence of parasitic growths. Here are a few facts which could be multiplied *ad infinitum* did time permit: A package of "kaskine," a much-vaunted remedy, sold at $1 an ounce, was found by the Massachusetts Board of Health to consist of nothing more or less than granulated sugar. A package of malt tablets, for the cure of dyspepsia, was found to be simply sugar lozenges colored by ferric oxide. A sample of "go to sleep" was found to consist essentially of sulphonal, a drug to be used only by the recommendation and under the supervision of a physician. Besides being poisonous, its continuous use defeats the very purpose for which it is intended. Hypnotics, as a rule, are dangerous when used indiscriminately by the laity. A sample of so-called "Boston drug," for the cure of drunkenness, consisted essentially of milk sugar, 9 parts, and ammonium chloride, 1 part. "Quince lotion" was found to contain borax and oil of bergamot (borax, as you well know, is the *synonym* for quince seed). Many of the patent medicines, however, are not harmless frauds but dangerous missiles. It is as though a highway robber extorted your money and then sent a bullet into your head as an expression of gratitude. Thus a "skin success ointment" was found to be composed of red oxide of mercury. Most of the face lotions contain enormous quantities of corrosive sublimate, 8 grs. per ounce having been found in one sample and 14·7 grs. per ounce in another (Mrs. McCorrison's Famous Diamond Face Lotion). All of the vaunted sarsaparillas, the innocent purifiers of the simpleton's blood, contain iodide of potash in large proportions. Church's was found to contain 2·25 per cent.; Leavitt's, 2·17 per cent.; Myrick's, 2·12 per cent.; Mattison's, 2 per cent.; Dana's, 1·17 per cent., and so on through the entire list, down to 0·32 per cent. (Hood's contains 0·75 per cent.). "The sale of such an article," says the Report of the Massachusetts

Board of Health of 1892, "in unlimited quantities by druggists, grocers and others is censurable. More than this, the method of its sale is dishonest, since the unwary purchaser is led to believe that he is purchasing a harmless vegetable remedy, namely, sarsaparilla. It may be seriously questioned whether the blood of persons who take iodide of potassium continuously is not decidedly impoverished, instead of being purified, as is claimed by the manufacturers. It is not uncommon to find persons who have used continuously, six, eight, or ten pint-bottles of one of these preparations. . . . The pale, sallow complexion of the habitual user of the 'sarsaparilla iodides' is, unfortunately, too often met with, wherever these remedies are freely advertised and sold." Most, if not all, of the cold cures contain cocaine in considerable quantities, and many a case of cocaine habit may be laid to the doors of the manufacturers of these panaceas. Of course, you will not wonder that all the opium cures contain morphine, for their success is certainly marvelous. Why take opium, with all the disadvantages and difficulties connected with its purchase, when one can buy something just as good (whatever that may be) in the shape of an "opium cure." The so-called Keeley's Double Chloride of Gold Cure was found to contain not a trace of gold (it is too expensive!). Nor will it surprise you to learn that many tonics, "recommended especially for the inebriates," contain alcohol in large amounts. Such an one is Parker's Tonic, "purely vegetable," which was found to contain 41·6 per cent. of alcohol by volume. Another is Whiskol, "a non-intoxicating stimulant, whisky without its sting," containing 28·2 per cent.; and Colden's Liquid Beef Tonic, "recommended for treatment of alcohol habit," 26·5 per cent. It may also be comforting to our total abstainers and to the many reverend gentlemen, whose flourishing signatures are to be found appended to very laudatory testimonials, to learn that the sixty-one samples of the more widely used tonics examined by the Massachusetts Board of Health contained alcohol in various proportions. I will cite only a few of the more prominent:

	Alcohol, Per cent.
Liebig Company's Cocoa Beef Tonic	23·2
Schenck's Seaweed Tonic, "entirely harmlesss"	19·5
Atwood's Quinine Tonic Bitters	29·0
Boker's Stomach Bitters	42·6
Burdock Blood Bitters	25·2

Copp's White Mountain Bitters, "not an alcoholic beverage" . . 6·0
(It should be noticed that this "tonic" contains more alcohol than the strongest beer.)
Drake's Plantation Bitters . . . . . 33·2
Green's Nervura . . . . . 17·2
Hoofland's German Bitters, "entirely vegetable and free from alcoholic stimulant" . . . . . 25·6
Hostetter's Stomach Bitters . . . . . 44·3
Kaufmann's Sulphur Bitters, "contains no alcohol" . . . . . 20·5
(As a matter of fact no sulphur was found in this preparation.)
Paine's Celery Compound . . . . . 21·0
Walker's Vinegar Bitters, "contains no spirit" . . . . . 6·1
Warner's Safe Tonic Bitters . . . . . 35·7
Ayer's Sarsaparilla . . . . . 26·2
Hood's " . . . . . 18·8
Dana's " . . . . . 13·5
And so on.

You will observe that the dose recommended on the labels is from a teaspoonful to a wineglassful from one to four times a day, "increased as needed." What a perversion of justice! Some poor wretch will be sent to the workhouse for selling a little whisky to a few friends, without a license, and men like the "tonic" manufacturers, who sell cheap whisky by the thousands of gallons, go scott-free and accumulate millions from their nefarious business.

That the various "hair tonics" contain dangerous proportions of lead will be somewhat more unpleasant news to our "belles" who improve on nature by those "innocent" remedies, or endeavor to restore their faded charms. Here are a few of them:

	Per Cent. of Lead.
Renown Hair Restorer contains	1·86
Mrs. Allen's Hair Restorer contains	2·30
Hall's Hair Renewer contains	1·75
Wood's Hair Restorative contains	1·59
King's Vegetable Ambrosia contains	1·51
Parker's Hair Balsam contains	2·32

That these people are not indicted and prosecuted for wholesale poisoning is a mystery to me! But such is our free country. "What fools ye mortals be."

Now what should be the duty of the druggist in the matter of adulteration? His duty is clear. As a citizen and a consumer he should put forward his best efforts to secure laws which would at least punish, if not prevent, wholesale fraud. As to drugs, he is evidently to be on the offensive rather than the defensive. His

training in the pharmaceutical college and in the drug store should enable him to recognize the grosser forms of adulterations and impurities and put him on his guard against the imposition of dishonest dealers. The statement is frequently made that the special training which the druggist is compelled to acquire is far above the requirements of his profession; in other words, it is useless. This is far from being the case. Unless the profession of the druggist is understood to be merely that of a tradesman, the training he receives is barely sufficient to meet the requirements. Every druggist should be able to assay his own drugs and detect adulterations and impurities. This is not hard to do if one follows the directions of the Pharmacopœia. "But," I will be asked, "of what use is this when the physicians dispense their own tablets, and all the druggist is called upon to do is to pour out So-and-So's elixir, cordial, or other preparation from a pint into a three-ounce bottle and label it according to the physician's directions? This is unfortunately true, but it is only the druggist's fault. The manufacturers usurped the prescription trade by first catching the eye and ear of the physician and then sending the druggist on a fool's errand to help them gain a firm footing in the physician's office. If the druggists spent one-tenth as much time, money and energy as the manufacturer, there would not be a single pill or tablet in the physician's office, and the old custom of dispensing *freshly* prepared remedies would again be in vogue to the great benefit of both physician and patient. Why not acquaint the doctors of your neighborhood that capsules freshly made from the *dry* powder are superior to pills; that powders are more certain in their action than tablets, and solutions more reliable than either pills or tablets? Why not make use of the information concerning the deterioration of drugs, especially alkaloids, when dried and incorporated with an excipient? Why not send a neatly printed circular to the physicians of your neighborhood, advising them, for instance, of the fact that the New York State Board of Health found quinine pills to be deficient in alkaloidal strength and that, therefore, with their permission, you will dispense capsules which are sure to contain a definite amount of the fresh drug? Why not send to the doctors samples of the various officinal elixirs which *you* prepared, showing that you can make as elegant preparations as the manufacturers? Why not experiment with the various drugs, the taste or smell of which is objectionable, with a view of render-

ing them palatable, and, having found the desired combination, notify your physicians of the fact and send them a sample? Why not have a label on every bottle or package, stating that the purity of the contents is guaranteed, and be able to stand by your guarantee?

With regard to patent medicine I will, at the risk of laying myself open to criticism, make the following assertion: A druggist who keeps patent medicines countenances a crime, and one who recommends them to the customers without knowing their composition is a party to a crime. It is bad enough to be compelled by the iron rules of trade and competition to handle these at times dangerous concoctions, but when the question is asked by the customer, Do you think Paine's Celery Compound is good for my nerves? the answer should invariably be, either "I do not know" or, if you do know, that this remedy contains 21 per cent. alcohol. "Mr. Smith, do you think that Mrs. Allen's Hair Restorer will be good for my hair?" "I do not know, madam. All I know is, that it contains 2·30 per cent. of lead, and is therefore dangerous." How are you to know these facts? Simply enough: They are published in the various reports of the boards of health, which have the pure food and drug laws, and in the pharmaceutical journals, and it should be incumbent upon your committee on drug adulterations to collect these data and produce them at your annual meetings. To replace the worthless or dangerous remedies which you cannot recommend, put up some of your own, stating *on the label the exact composition.* Never mind about giving away the secret. You will gain the confidence and respect of your customers, who will rather deal with an honest man than with one who may at any time be accused of being a cheat, without being able to defend himself. Besides, if your remedy is secret, why is it superior to the patent medicines which have "testimonials?"

This, gentlemen, should be your ideal—strive for it, work for it. Take out the education of the public in matters pertaining to drugs from the hands of the unscrupulous patent-medicine vender, and that of the physicians from the hands of the manufacturer. Awaken from the lethargy into which you may have allowed yourself to fall. Make the best of your ability and special preparations, and above all make of yourself an important and useful factor in the life of the community. It remains with you either to remain grocers and confectioners or to raise yourself to the dignity of a pharmaceutical chemist.

THE IDENTIFICATION AND PROPERTIES OF *a*- AND *β*-EUCAINE.[1]

By Charles Lathrop Parsons.

Two new alkaloids under the names *a*-eucaine and *β*-eucaine have recently been offered to the medical and dental profession for use as a local anesthetic. There is scarcely a reference to either in any strictly chemical journal, but their use and physiological properties have been very fully discussed in medical and pharmaceutical publications. Although they are proprietary drugs, the fact that *β*-eucaine is so often substituted for cocaine, in dental preparations, hay-fever remedies, and other proprietary medicine, makes it highly desirable that their distinctive properties be carefully studied and that methods be found for their identification and separation from cocaine and other alkaloids. It was owing to the fact that I was called upon to analyze a special dental preparation containing eucaine that my attention was first called to the existence of the alkaloid, and I was greatly handicapped by the silence of chemical literature upon the subject.

a-Eucaine was first obtained by George Merling[2] by synthesis from triacetonamine through triacetonamincyanhydrin to triacetonalkamincarbonic acid, which, by the action of benzoyl chloride and subsequent action of methyl iodide in caustic potash solution, becomes *n*-methylbenzoyltetramethyl-*γ*-oxypiperidincarbonic acid methylester or "*a*-eucaine." This, when treated with hydrochloric acid, acts like other alkaloids forming a hydrochloride, in which form it is prepared and sold.

β-Eucaine was discovered by Albrecht Schmidt and George Merling[3] and was obtained by purifying the vinyldiacetonalkamine of Fischer[4] and substituting a benzoyl group for the hydrogen atom of the hydroxyl. Thus "*β*-eucaine" or benzoylvinyldiacetonalkamine, is also an alkaloid which, when treated with hydrochloric acid, forms the hydrochloride.

It will be seen from the structural formulas of *a*- and *β*-eucaine that they have a close relation to cocaine and to tropacocaine. It

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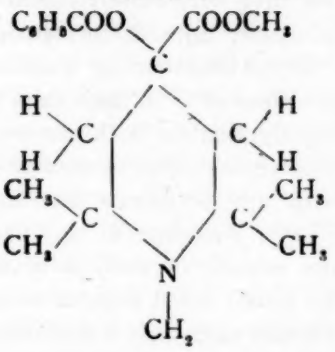
[1] Read at the Denver meeting of the American Chemical Society, August 29, 1901, and reprinted from the *Jour. Amer. Chem. Soc.*, 1901, p. 885.

[2] *Apoth. Ztg.* (1896), p. 293, 418, 448.

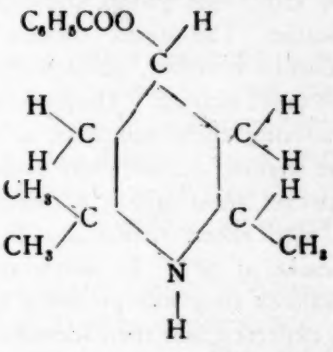
[3] Virchow's *Archives f. path. Anat. und Phys.* (1896,) vol. 145.

[4] *Ber. d. chem Ges.*, 17, 1894.

a-Eucaine.



β-Eucaine.



was this close chemical connection which led to the belief that they would show similar anesthetic properties.

It is not the purpose of this paper to enter into a discussion of the physiological and therapeutic effects of the eucaines, but it is not out of place to state that the chief claims of their superiority over cocaine are that they are far safer to use, that they cause no excitation of the heart's action, that *β*-eucaine, especially, is some four or five times less toxic, that they have equal analgesic power with cocaine, that they do not decompose by boiling, and their hydrochlorides can hence be easily sterilized, and that their solutions will keep for an indefinite time without decomposition. The quite extended use of *β*-eucaine would seem to show that many of these claims have been substantiated. It would be well to add that *a*-eucaine has at times an irritating action or smarting effect of its own before anesthesia sets in, which has rendered its acceptance and use somewhat doubtful. It is claimed that this is absent with *β*-eucaine, or at least is no more often the case than with cocaine. *β*-eucaine is the one that is almost exclusively used, and the firm which manufactures both furnishes only *β*-eucaine when "eucaine" alone is called for. Accordingly, almost all preparations on the market consisting in part of eucaine contain *β*-eucaine hydrochloride, and the question of analysis would generally be a distinction between this salt and cocaine.

To establish means of identification of eucaine, all the well-known reactions of the alkaloids have been tried, and I have endeavored to find new ones applicable to this particular case.

In general the properties of the eucaine alkaloids follow those of

the strychnine group, and especially do they very closely resemble cocaine. The bases themselves are readily soluble in benzine, chloroform, ether, chloroform-ether, petroleum-ether or gasoline, and amyl alcohol. They can be easily extracted from their salts by rendering their solutions in water slightly alkaline with ammonia and shaking out with any of the above solvents. This extraction is, however, most rapidly accomplished with light petroleum distillates or with ether. *a*-Eucaine melts at 103°, *β*-eucaine at 91°, and cocaine at 98°. In following out any scheme of analysis of the alkaloids they will probably always be found where cocaine would be expected, and their identification becomes essentially a separation from each other and cocaine. *a*- and *β*-eucaine are sold in the form of their hydrochlorides, and it is upon this salt that most of the tests for their identification should be made. As usually prepared, *a*- and *β*-eucaine hydrochlorides are white powders, identical in appearance. They are, however, easily crystallizable.

a-Eucaine hydrochloride melts at about 200° C. and decomposes at the same time. It is soluble at ordinary temperature in about ten times its weight of water, solubility varying with temperature. It is more soluble in hot water, from which it crystallizes out to an approximately 10 per cent. solution on cooling. It is soluble in about its own weight of alcohol, 10 grammes requiring from 8 to 9 grammes of alcohol for solution. It is but slightly soluble in ether or olive oil, but glycerol dissolves it much the same as water.

β-Eucaine hydrochloride melts at 268° C. with decomposition. At ordinary temperatures it is soluble in water to the extent of about 3 per cent., but is more than twice as soluble in hot water, from which most of the excess crystallizes slowly after cooling. Its solubility in alcohol is greater than in water, or about 11 per cent., varying somewhat with the temperature. This comparative insolubility is one of its chief characteristics, especially differing from cocaine hydrochloride, which dissolves in less than its own weight of either water or alcohol. It is almost insoluble in ether or olive oil.

REACTIONS IN WHICH THE HYDROCHLORIDES OF *a*-EUCAINE, *β*-EUCAINE AND COCAINE ACT ALIKE.

Mayer's reagent gives with either *a*- or *β*-eucaine a light yellowish amorphous precipitate.

Wagner's reagent gives a voluminous reddish brown precipitate even in dilute solutions.

Tannic acid (1 : 10) gives no precipitate or only a very slight transparent flocculency.

Picric acid (1 : 100) yields a fine lemon-yellow precipitate in solutions stronger than 1 per cent., which is soluble in acids, but in dilute solutions yields no precipitate. Even in moderately strong solutions the precipitate formed by the first drop or two of reagent redissolves. The precipitate with *a*-eucaine is more insoluble than either of the others, and comes down, accordingly, in somewhat more dilute solutions.

Iodine in alcohol yields a brown precipitate soluble in excess.

Fröhde's reagent (sulphomolybdic acid) gives no precipitate.

Mercuric chloride (1 : 20) gives no precipitate in dilute solution, but in moderately strong solutions gives a fine white precipitate, easily soluble in excess.

Ferric chloride and potassium ferricyanide mixed give no precipitate except a white one in strong solutions. Allen[1] states that cocaine gives a precipitate of Prussian blue, but I have not been able to obtain it. Ferric chloride is stated by some authors to turn red on boiling one or two drops of a dilute solution with cocaine, owing to the formation of benzoate of iron. But as it also turns red with either of the eucaines or simply with distilled water the reaction is of no value. It gives no precipitate even in strong solution.

Cadmium iodide gives a white precipitate.

Potassium ferrocyanide gives in solution of about 10 per cent. a slight colorless gelatinous precipitate. A saturated solution of *β*-eucaine does not yield this precipitate probably because the solution is too weak.

Potassium ferricyanide gives a white precipitate in moderately strong solutions, which is more easily thrown down if solution is acid with hydrochloric acid.

Potassium bromide, chloride, or bromate give no reaction.

If a few drops of a solution of either of the hydrochlorides of *a*- or *β*-eucaine or cocaine be acidified with strong nitric acid, evaporated to dryness in a watch-glass, and treated with one or two drops of a solution of alcoholic potash, a very characteristic odor of benzoic ethyl ester is obtained. This reaction would probably also be given with other alkaloids containing the benzoyl group.

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[1] "Commercial Organic Analysis," Vol. III, Part II, p. 275.

REACTIONS CHARACTERISTIC OF α-EUCAINE SALTS.

Potassium iodide (1 : 10) gives, in even moderately dilute solutions of α-eucaine hydrochloride, a white silky and glistening precipitate. This precipitate has much the same appearance as the one obtained when stannous chloride is added to a cold dilute solution of mercuric chloride. β-Eucaine and cocaine give no reaction.

Ammonia, even in dilute solution, precipitates the bases α- or β-eucaine or cocaine, but α-eucaine is almost insoluble in excess. In 1 per cent. solution the white precipitate is at once thrown down, and in the case of β-eucaine or cocaine dissolves immediately on addition of about their own volume of strong ammonia. α-Eucaine, so precipitated, can be diluted at least ten times with strong ammonia without solution. In stronger solutions the difference still exists but is not so easily recognized. A 3 per cent. solution of β-eucaine or cocaine requires about five times its own volume of ammonia to be dissolved, and stronger solutions much in proportion to the per cent. present. In other words a strong solution of ammonia will dissolve about one-half of one per cent. of the bases β-eucaine or cocaine, while it will dissolve but a very small fraction of a per cent. of α-eucaine. In dilute solutions this is a very characteristic reaction for α-eucaine and strong solutions are, of course, very easily rendered dilute for the test.

Potassium dichromate, in strong solution, added drop by drop to a 0·5 per cent. solution of α-eucaine, begins to throw down a fine lemon-yellow precipitate after addition of one or two drops. The precipitate is then much increased by one or two drops of strong hydrochloric acid, and is then quite insoluble, dissolving only after several times diluting the volume of the solution. With stronger solutions the precipitation takes place at once, the first drop giving a more and more permanent precipitate as the solution grows stronger. The precipitate is notably insoluble in either water or hydrochloric acid. More dilute solutions either show no precipitate or only after addition of hydrochloric acid. Cocaine, 1 per cent. solution, is not precipitated by potassium dichromate, but the addition of one or two drops of concentrated hydrochloric acid throws down a yellow precipitate easily soluble in very slight excess of hydrochloric acid or on dilution of the solution with water. Weaker solutions do not precipitate, while stronger solutions precipitate at once. The precipitate is, however, easily soluble as before. β-Eu-

caine acts like cocaine. The precipitate in all cases is lemon-yellow. The *a*-eucaine precipitate is quite crystalline. All three may throw down a small amount of a yellow colloidal precipitate which sticks to the side of the test-tube and dissolves but slowly, although this in no wise interferes with the test, and does not take place if reagents are added slowly. While this test depends upon the very much greater insolubility of the *a*-eucaine salt, the non-precipitation in dilute solutions of a certain strength until after the addition of hydrochloric acid is quite characteristic for all. The correct strength is about 0·5 per cent. solution of *a*-eucaine and about 1 per cent. for *β*-eucaine and cocaine. In the case of cocaine and *β*-eucaine, the test may be conveniently applied by precipitating a stronger solution than 1 per cent. with potassium dichromate solution, diluting carefully with water until precipitate just dissolves. On addition of a drop of concentrated hydrochloric acid the precipitate will at once re-form. This cannot be done with *a*-eucaine, for precipitate once formed it is difficult to get it to dissolve at all.

Chromic acid (1 : 20) acts similarly to the dichromate.

REACTIONS OF COCAINE DISTINGUISHING IT FROM EITHER *a*- OR *β*-EUCAINE OR FROM BOTH.

If a small amount of cocaine hydrochloride be rubbed up with dry mercurous chloride (calomel), and then moistened with alcohol, it rapidly turns to a grayish black. *a*-Eucaine hydrochloride becomes slowly a dark gray. *β*-Eucaine hydrochloride is not affected.

Platinic chloride throws down slowly a yellow crystalline precipitate from a 1 per cent. solution of cocaine hydrochloride which is insoluble in hydrochloric acid. *a*- and *β*-eucaine hydrochloride in 1 per cent. solution are not altered. In stronger solutions all three hydrochlorides are immediately precipitated by platinic chloride, but the cocaine precipitate is not soluble in hydrochloric acid, while the precipitates by either eucaine are at once dissolved.

F. Giezel[1] has pointed out that the permanganate of cocaine is much more stable than that formed by most other alkaloids. This fact gives rise to one of its most distinguishing reactions. The test is applied upon a microscopic slide or in a small watch-glass. A drop of a solution of the hydrochloride is placed upon the glass and a

[1] *Pharm. Ztg.*, p. 132, 1886.

very small drop of a solution of potassium permanganate is added. If the solution is strong enough for a precipitate to appear at once the change can be observed on the precipitate, but it is preferable to watch the change of color of the solution itself. With either of the eucaines the color almost immediately begins to change to brown, while with pure cocaine the original color holds generally for fully half an hour, but also eventually changes to brown. The cocaine precipitate examined under the microscope is a beautiful violet-red which also in time turns to brown. This is true of the eucaine precipitates at first, but they rapidly change to brown. Excess of permanganate should be avoided.

Cocaine hydrochloride in solution, in either water or alcohol, polarizes light strongly to the left. Antrich[1] states that this is the best test for the purity of the salt. According to this authority for aqueous solution $S_d = -52{\cdot}2$ and for solution in alcohol of 0·9355 sp. gr., $S_d = -68{\cdot}06$. A solution of the hydrochlorides of either α- or β-eucaine does not polarize light.

Cocaine when used in the eye almost always causes mydriasis. β-Eucaine does not dilate the pupil.

REACTIONS CHARACTERISTIC OF β-EUCAINE HYDROCHLORIDE.

The chief characteristic property of β-eucaine hydrochloride is its comparative insolubility in water and alcohol, and it is readily distinguished from cocaine by this property. A small test sample of cocaine hydrochloride, if moistened with its own volume of alcohol or water, dissolves at once, while β-eucaine hydrochloride is little affected. In making the test, however, where weighed quantities are not used, it should be remembered that even β-eucaine is soluble to the extent of 11 per cent. in alcohol, and a too large amount of the solvent should not be used. Just enough to moisten is all that is necessary to dissolve cocaine or α eucaine hydrochloride.

No chemical reactions of a positive character have been found characteristic of β-eucaine, but the results with permanganate, mercurous chloride, platinic chloride, and polarized light, will identify cocaine, while the tests with potassium iodide, potassium chromate and ammonia will distinguish it from α-eucaine. These with the other reactions noted will serve to separate it from other alkaloids.

(*To be concluded.*)

[1] *Ber. d. chem. Ges.*, 20, 310.

CORRESPONDENCE.

ASSOUAN, UPPER EGYPT, January 21ST.

To the Editor of the AMERICAN JOURNAL OF PHARMACY:

Through the kindness of Daoud Takla, American Consul, I have had opportunity of inspecting the senna and gum arabic as they are bought by the merchants at this place, and of learning about their commercial history. According to the chief merchant—a most notable follower of the Prophet, over 6 feet tall, black as the darkness in the Mammoth Cave, dignified and courteous as becomes a man of his high local position—the trade, since the destruction of the hosts of the Mahdi, has become as active as it was before his misrule, with the difference that camels no longer bear their burdens into Assouan, having been superseded by the less picturesque but more practical railroad. The saving of cost to some one must be great, as from some districts nearly a whole year was formerly required for the transit. The gum arabic is bought of the natives by traveling merchants, sorted into three varieties, packed into large sacks made of palm leaf and sold to the merchants here, who hold it until notified by telegram from Cairo that the market is favorable, when they ship it down the Nile. I was told that the gum is gathered sometime during the months of January, February and March, each collector having vested rights in a certain portion of the forest. Long incisions are made vertically through the bark and the exuding gum allowed to harden before gathering; in this way, the trees not being injured, the collections can go on year after year. It is affirmed that in Upper Egypt the gum arabic tree flourishes when watered, but fails to yield gum. The warehouses of the merchants of Assouan would hardly suffice in Philadelphia, being simply rectangles surrounded by walls about ten feet high, made of dried mud. In these roofless enclosures sacks or mats containing many thousands of pounds of the gum were piled one upon another. The finest variety of the gum is a very white, beautiful article.

Yours truly, H. C. WOOD.

PHARMACEUTICAL MEETING.

The sixth of the series of pharmaceutical meetings of the Philadelphia College of Pharmacy for 1901–1902 was held on Tuesday, March 18th. Mr. George M. Beringer, a member of the Board of Trustees, presided. The first paper was on "Liquid Soaps for Surgical and

Toilet Purposes," by M. I. Wilbert, apothecary at the German Hospital, Philadelphia, and was read in the absence of the author by Charles H. LaWall (see page 172). In connection with the paper, Mr. Wilbert sent several samples illustrating the preparations made by the process outlined by him, and also several other samples: one being a soft-soap made of cottonseed oil, according to the formula published in the AMERICAN JOURNAL OF PHARMACY for May, 1900 (Vol. 72, page 212), the only difference being the substitution of cottonseed oil for the official linseed oil, on account of the difference in price; also a sample of "liquid soda soap," which differs from the formula given in the A. J. P. quoted above, by the substitution of olive oil for cottonseed oil. This was done to overcome any possible objections to the use of this method for making the official Linimentum Saponis. During the very cold winter weather, soap liniment made from cottonseed-oil soap will sometimes gelatinize; this is, of course, objectionable, and may be obviated by using olive oil, the chemical composition of which will allow it to remain limpid at much lower temperatures. The sample of "soap liniment" was made from the olive oil "liquid soda soap," according to the formula given in the paper quoted above.

In the discussion that followed the reading of the paper, Mr. Beringer called attention to the fact that a number of years ago some of the French and German soaps were imported in liquid form, and that the antiseptic value of liquid soaps was becoming recognized and appreciated by physicians. Dr. Lowe suggested that Columbian spirit might be used in place of ethyl alcohol, and that oil of eucalyptus might be substituted for carbolic acid in the formula given. Dr. Boston said that he had found that microorganisms would grow in 3 to 5 per cent. solutions of carbolic acid. Mr. Beringer stated that they probably would not grow in solutions containing free alkali as in the soaps proposed by Mr. Wilbert.

The next paper was on "The Spread of Tuberculosis by Coughing," by Dr. L. Napoleon Boston, well known for his pathological and sanitary work (see page 169). In discussing this paper, Dr. Lowe referred to the investigations of Dr. Flick, who some years ago showed conclusively that consumption was a contagious disease; and he furthermore believed that there should be a thorough disinfection of homes where consumptives have lived. He also referred to the statement made by the late Dr. DaCosta, that if a patient has

a persistent cough and is losing weight it indicates consumption. Mr. Hancock asked why bakers and cooks, as stated in Dr. Boston's paper, were more subject to tuberculosis than others. Mr. England gave as the probable cause the handling of materials containing fine particles. He also alluded to the fact that the Government was instituting measures to prevent immigrants with tuberculosis from coming to this country. Mr. Hancock stated that in the work of the lapidary and others, who came constantly in contact with fine particles of metal or stone, that the fine particles might set up an irritation in the lungs and thus predispose the worker to consumption. Dr. Boston answered a number of the questions proposed by Mr. Beringer and others, stating some of the rules in medicine regarding tuberculous patients, and showed that the spread of tuberculosis was influenced by race considerations, the occupation of the individual and the age of the person. He referred to the admirable work by Doctors Flick and Anders on the contagiousness of tuberculosis, and of Dr. Ravenal, who is of the opinion that tuberculosis can be transmitted from animals to man.

The next paper was: "On the Manufacture of Deodorized Opium and Tincture" (see page 157), by Mr. Albert E. Ebert, of Chicago, which was read on behalf of the author by Mr. Thomas S. Wiegand.

Mr. Beringer said that the subject was one of great moment to physicians and pharmacists, and he thought that the paper of Mr. Ebert would revolutionize our ideas concerning the properties of the constituents of opium. In commenting upon Battley's sedative, Mr. Beringer stated that in this preparation there was no treatment for the removal of obnoxious principles other than repeated evaporation and solution, during which the resinous matters carrying such principles were removed. Mr. Beringer further said, that while he agreed with Mr. Ebert that granulated opium should be made official, still he did not favor the use of gasoline in its preparation. He said that it was unfortunate that the U.S.P. did not introduce a commercial benzin, and also a purified benzin, giving a method for its preparation. He had for some years been making a purified benzin for his own uses, and said that he had found in some cases the use of a little benzin with ether in the extraction of certain drugs, as well as in the preparation of deodorized opium, prevented an emulsion that was so difficult otherwise to handle. Some years ago

Mr. Beringer called attention (see this JOURNAL, 1890, p. 6) to the properties of commercial benzin, and said that the presence of heavier oils and sulphurous compounds prevented the use of the article for making an agreeable and non-nauseating deodorized tincture of opium. In regard to the use of acetic acid in extracting the narcotine as suggested by Dr. Ebert, Mr. Beringer thought that it did not form an acetate with narcotine, although its use might be advantageous in removing traces of morphine. Others discussing the paper were Messrs. LaWall, England and Kraemer.

Mr. Wiegand commented upon the comprehensiveness of Mr. Ebert's paper and said that it should be attentively read by every one at all interested in the real progress of pharmacy. It is really a history of the subject and covers the ground most thoroughly, and with great fairness. The points and notes most worthy are: (1) the fact that an aqueous preparation of opium is preferable to a hydro-alcoholic one, because it leaves behind the fatty resinous caoutchouc matters which seem to be the most disturbing elements of the drug; (2) the fact that a proper grade of benzin purified thoroughly will remove any of the remaining objectionable material, and has less solvent power over the morphin than ether; (3) the fact that narcotine is not a disturbing element, but on the contrary a stimulant tonic, counteracting the depressing effects that the ordinary preparations of opium produce; (4) incidentally the necessity of a purer and better benzin, being directed by the pharmacopœia and the well-advised caution against the concentrated liquid preparation of opium for the *short-cut* way of making the galenical preparations of opium. Mr. Wiegand moved that a vote of thanks be given Mr. Ebert for the valuable paper he had contributed. The motion was unanimously adopted.

A paper by Ferdinand A. Sieker, New York City, on "Fluid Extract of Nux Vomica" (see page 175), was read by Mr. Freeman P. Stroup.

Mr. England exhibited various samples of caseins, which are used in the arts and for food; also, a sample of sugar of milk (99·7 per cent. pure) and a milk powder for making a substitute for milk. Mr. Beringer called attention to the fact that the difficulty connected with the manufacture of sugar of milk in this country heretofore has been the impurities in the water.

The discussion on "Modern Drug Methods," which had been postponed from a previous meeting, was introduced by Dr. Lowe, who referred to a method of recording prescriptions and the advantages of a Torsion balance for prescription work. Mr. McIntyre referred to the differences in some of the modern stores in the different large cities which he had visited, and said that in each city, and, indeed, in different sections in the same city, different conditions prevailed, and these had to be dealt with accordingly. The modern drug store, as the one of former days, requires the constant supervision of the owner, and the pharmacist must be ready to supply those things asked for by the physician and the public. Mr. Beringer also spoke in a similar strain, and said that in each locality different methods must be pursued; and that the business methods must be shaped according to the locality, irrespective of even what we may have as our ideal. Of course, after the confidence of physicians and the public is secured, then individual influences may be brought to bear. Mr. Beringer alluded to a method of keeping a daily record of prescriptions which he had adopted, which included originals, renewals and the price of each. In regard to the subject of weighing medicines, Mr. Beringer said that he hoped that no pharmacist placed the substance on the scale-pan direct, and that he himself used different kinds of paper and glass crystals, depending on the nature of the substance to be weighed.

Mr. Wm. Vought, a representative of the Leitz microscope firm, called attention to the possibilities of the pharmacist doing bacteriological, pathological and other similar lines of work. He enumerated a number of instances showing that properly qualified persons, particularly in the West, had been successful in this direction, not only adding to their financial income, but also to their professional standing. He stated that an outlay of about $100 was sufficient for equipping a laboratory to carry on most of this work.

At the next meeting there will be a discusssion on the advisability of promulgating a definition for the term spoonful, and also on the metric equivalents of the same. The following circular has been gotten out, and those desiring to express an opinion on the questions contained therein are requested to send the same to either Mr. M. I. Wilbert, Apothecary to the German Hospital, Philadelphia, or to the Secretary of the Committee having these meetings in charge.

DEFINITION OF SPOONFUL.

Would you be in favor of promulgating a definition for the term spoonful, with a view of obtaining more uniformity and greater accuracy in the administration of liquid medicines?

If so, would you be in favor of adopting the definition as given in the French Codex? This is as follows: A spoon is full when the liquid it contains comes up to, but does not show a curve above, the upper edge or rim of the bowl.

For the benefit of those physicians who are using the metric system, it would appear advisable to adopt some acceptable equivalents for the approximate measures that are used in speaking of, or in measuring out, doses of liquid medicines. In the following table we have indicated:

1. The exact equivalent in the metric system, of the tea, dessert and tablespoon as used in this country at the present time.

2. The approximate equivalents as used by some practitioners.

3. Proposed metric equivalents, based on the actual capacity of the spoons in use at the present time.

Will you kindly indicate which of these you would favor?

	1	2	3	4
Teaspoonful	3·696	4	5	5
Dessertspoonful	7·393	8	10	10
Tablespoonful	14·786	16	15	20

NOTES AND NEWS.

THE ITALIAN PHARMACOPŒIA is being revised, and we are informed by the *Chem. and Drug.* that it will contain, among other features, formulas for veterinary use, an official method for the analysis of surgical dressings, a method for the sterilization of solutions for hypodermic use, tables of poisons, antidotes, incompatibles and dangerous mixtures, and will make obligatory the use of a model pill excipient in cases where none is mentioned in the prescription.

METRIC SYSTEM IN THE UNITED STATES.—The report of the special committee appointed by the Franklin Institute to consider the feasibility and advisability of the adoption of the metric system in the United States is as follows:

WHEREAS, It is desirable to obtain an international standard of weights and measures, also to simplify and regulate some of our existing standards; and

WHEREAS, The metric system is commendable not only as a suitable international standard, but also for facility of computation, convenience in memorizing and simplicity of enumeration;

Resolved, That the Franklin Institute approves of any movement which will

promote the universal introduction of the metric system with the least confusion and expense.

Resolved, That the national government should enact such laws as will ensure the adoption of the metric system of weights and measures as the sole standard in its various departments as rapidly as may be consistent with the public service.

THE VALUE OF A COLLEGE EDUCATION.—R. T. Crane, of Chicago, recently set out to discover by practical means what is the real value of a college education. He addressed inquiries to the presidents of a number of universities, to nearly 1,600 university graduates, and to 100 or more business men who have had large opportunities for observation. The testimony gathered thus from the most varied sources is brought together in book-form, and it includes many interesting expressions of opinion. No conclusion which is at all absolute is reached, and this must be reckoned to be impossible in the very nature of the case. Nevertheless, it is very satisfactory to know that some progress has been made in the discussion of the old subject, for Mr. Crane seems to have found no one who really thinks, as some formerly did, that a college training is a hindrance to a young man.

COMMERCIALISM AND MEDICINE.—In an address at the formal opening of the Mercy Hospital Operating Amphitheatre, under the auspices of the Chicago Medical Society and Northwestern University, Dr. John B. Deaver, Philadelphia, said: "A spirit of commercialism is one of the greatest enemies of a medical school. A large production at a cheap rate may be a good enough aim for a business house, but this spirit is fatal to a medical school. Too many schools seem to take pride in their large enrollment of students, forgetting at the same time that teachers and clinical material are entirely inadequate for the proper instruction of so large a body of men."

LICENSES FOR NURSES.—The question as to whether trained nurses should not be licensed and all others forbidden by law to practice came up at a recent meeting of a woman's club, according to the New York *Evening Sun*. One member opposed this proposition so vigorously that she was asked to take the floor and give the reason for her opposition. She declared that many young women took up nursing while better fitted for any other vocation on earth, while there were those, on the other hand, whose experience, acquired only through performing, gratuitously, services for neighbors and friends, showed such natural aptitudes that they were always in demand. She said such were often driven through force of circumstances to adopt the calling of a nurse, and would, if the license law were passed, be unjustly debarred. "Sensibility and fine feeling," said the woman, "are as necessary in caring for the sick and convalescent as training, and a woman not 'trained,' but with all the qualifications of a nurse, was more valuable than a trained nurse without these natural qualifications." The woman then illustrated her meaning by an anecdote. "The children's ward of a hospital in one of our Western cities had been given a globe of gold fish. The little patients took great pleasure in watching the fish darting in and out among the aquatic plants and seemed to forget for a time sickness and suffering. One of the nurses, wishing to use the table on which the globe of gold fish stood, put it on the radiator. A small patient called out in alarm that the fishes would be roasted. The nurse only laughed,

and left the globe where she had put it, and upon her return from dinner she saw the water was at the boiling point and the fish all dead." All agreed that the gentle offices of such a nurse could easily be dispensed with.

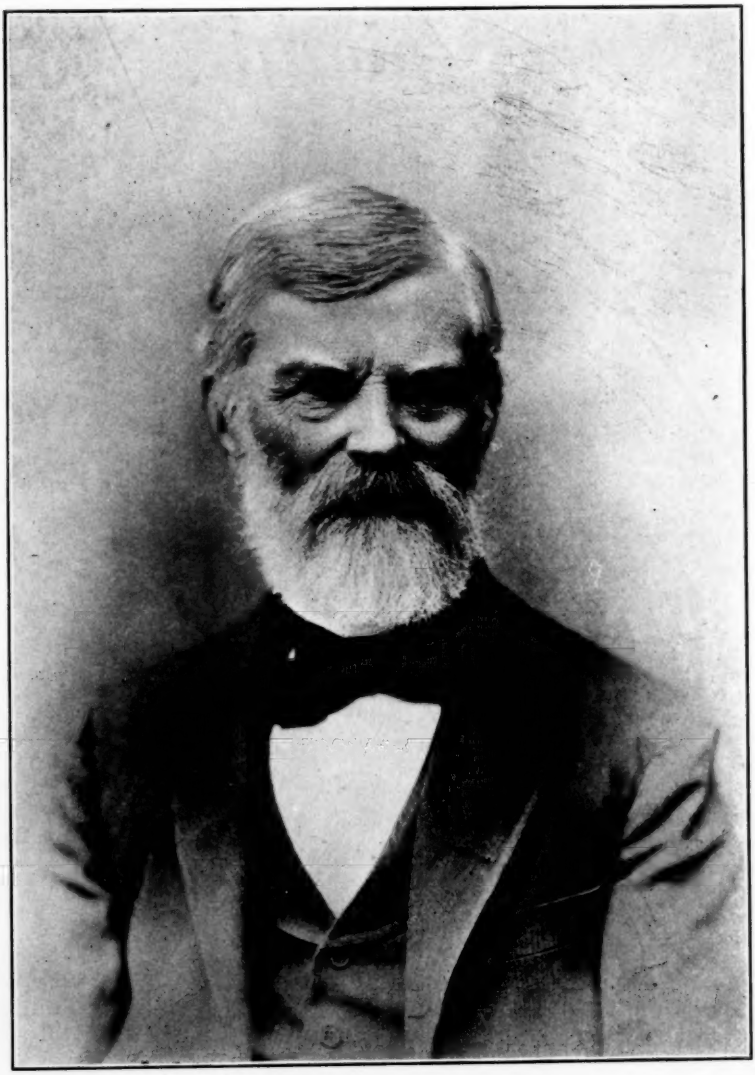
A PORTRAIT OF PROF. PRESCOTT.—At the supper and reunion that was held at the St. Louis meeting of the A. Ph. A. of the Alumni of the University of Michigan, a plan was formulated to procure a life-size oil portrait of Dr. A. B. Prescott and present it to the university. A committee was appointed consisting of Dr. A. B. Lyons, Chairman; A. B. Stevens, Treasurer, J. W. T. Knox, Secretary, and F. W. R. Perry and A. S. Parker, who have successfully arranged for this undertaking. The portrait has been made by Percy Ives, one of the best known of portrait artists, and is to be presented to the university during commencement week, the exact date not yet being determined. It is desired also to have a general reunion and banquet for the alumni on that occasion, and it is hoped that every alumnus of the pharmacy school will make a strong effort to be present. Some distinguished scientist will be invited to deliver the principal address of the occasion, and there will be a number of shorter addresses by alumni and others.

A BANQUET TO ENNO SANDER.—On the occasion of his eightieth birthday the pharmaceutical friends of Dr. Sander tendered him a banquet in St. Louis. Mr. Albert E. Ebert, of Chicago, acted as toastmaster, and toasts were responded to by various members of the Faculty and alumni of the St. Louis College of Pharmacy, of which he is an ex-president, one of the founders, and was at one time a member of the Faculty. According to the *American Druggist*, Dr. Sander was born in Trinum, Anhalt, Germany. He took his Ph.D. degree in chemistry at Halle, in 1847, participated in the revolution of 1848, was captured and imprisoned, but subsequently pardoned. Coming to the United States in 1850, he went to St. Louis in 1852, where he first taught school, and then engaged in the practice of pharmacy. In 1868 he began the manufacture of chemicals, and later took up artificial mineral waters, in which he has been very successful. In 1871 he was elected president of the American Pharmaceutical Association, and for forty years consecutively has been treasurer of the St. Louis Academy of Sciences.

AMERICAN CHEMISTS HONORED.—*Prof. Wolcott Gibbs*, of Harvard, America's foremost chemist, was honored on February 22d by having conferred on him by the University of Pennsylvania the Doctorate of Laws; *Prof. Ira Remsen* was installed as President of Johns Hopkins University at the twenty-fifth anniversary of the founding of that institution; the new Health Board of New York City made an important departure from precedent by creating a medical advisory board of twelve prominent physicians (who serve without pay), with *Prof. Charles F. Chandler*, of Columbia University, at the head, with the title of Consulting Sanitarian.

THE AMERICAN ELECTRO-CHEMICAL SOCIETY, which has just been organized with nearly 300 members, will hold its first meeting in Philadelphia from April 3d–5th.

THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION will hold its annual meeting at Buena Vista Spring Hotel, June 24th, instead of June 17th, as previously announced.



EMIL SCHEFFER.